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## Evaluation of mango (*Mangifera indica* L.) cultivars for vegetative growth, flowering and orgenoleptic characteristics under indo gangetic plains

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### Abstract

The present investigation entitled “Evaluation of mango (*Mangifera indica* L.) cultivars for vegetative growth, flowering and Orgenoleptic Characteristics under indo gangetic plains revealed that maximum number of leaves were found in Dashehari (15.29), Maximum leaf area was observed in Chausa (96.96 cm<sup>2</sup>) and Maximum leaf area per shoot was recorded in Sepia (1108.33 cm<sup>2</sup>). Maximum number of flowers was observed in Langra (1839.13). The maximum number of hermaphrodite flowers per panicle was noted in Langra (456.00) while, the minimum male flower per panicle was recorded in Amrapali (797.58). Maximum sex ratio was calculated in Alphonso (9.00), while, the minimum sex ratio was observed in Langra (3.23). Maximum yield per tree was found in Langra (501.00 kg/tree).

**Keywords:** Mango, cultivars, leaf, flower, inflorescence

### 1. Introduction

Mango (*Mangifera indica* L.) is an important fruit crop of India belonging to the family Anacardiaceae and acknowledged as “King of Fruits”. It is the national fruit of India widely grown for its special features like high nutritive value, high productivity, processing potential, delicious taste and suitability to be grown in widely ecological amplitude. In India, the fruit is cultivated in the largest area, i.e., 6597 thousand hectare and the production is around 97967 thousand million tons (Anonymous, 2018-19) [3].

The mango is very nutritious and has great health benefits both, when eaten raw and as a ripe fruit. The fruit (ripe and unripe), bark, leaves, seed, root and even the smoke of burning mango leaves have healing properties. It is known to be a very good source of vitamins such as vitamin C, thiamine, riboflavin, and niacin and  $\beta$ -carotene. Mango contains numerous polyphenolic and phytonutrient compounds that have been shown to exhibit antioxidant properties.

Mango trees grow to an impressive size and under favourable conditions, it may attain a height of 25 meter. The trees are mostly evergreen and erect (Jilani *et al.* 2010) [6]. Mango is a tropical fruit tree which usually flowers in spring and produces attractive fruits. Mango inflorescence is a branched terminal panicle, up to 0.6 meter long, and has several hundred to several thousand flowers. Mango inflorescence is a flowering shoot called panicle and it bears two types of flowers, male and hermaphrodite flowers. Sex ratio is a variable component within panicles, tree and among cultivars. The initial fruit set is directly related to the proportion of perfect flowers (Singh *et al.*, 2015) [15]. A tree can have 200 to 3000 panicles with a potential to produce tremendous number of flowers (Barui and Ghosh, 2002) [5]. Mango belongs to the group of plants, in which an antagonism between vegetative vigour and flowering intensity is observed. Therefore, any factor that reduces the vegetative vigour, without altering the metabolic activity, favours flowering. The unravelling of the nature of flower triggering and signalling elements is of utmost importance (Narvariya *et al.*, 2015) [14].

All the five attributes *viz.*, variety, size, colour, shape and flavour are significant. At present Indian mangoes are exported to neighbouring markets. The quality attributes such as colour, shape, size and flavour should be maintained in newly evolved varieties so that India can increase its presence in the international market. Hence maintenance of quality for international standards and developing forward and backward linkages in the production and marketing would possibly facilitate the mango exports from India with high price realization in the European countries (Thulasiram *et al.*, 2016) [20].

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**2. Materials and Methods**

The present investigation entitled “Evaluation of mango (*Mangifera indica* L.) cultivars for vegetative growth, flowering and Organoleptic Characteristics under indo gangetic plains was conducted at the Horticulture Unit, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi (U.P.) India during 2014-15 and 2015-16.

**2.1 Treatments details**

The experiment consisted of eleven treatments, which are as follows with their symbols.

**Table 1:** The experiment consisted of eleven treatments

S. No.	Treatments (cultivars)	Symbols
1	Amrapali	T <sub>1</sub>
2	Langra	T <sub>2</sub>
3	Dashehari	T <sub>3</sub>
4	Mallika	T <sub>4</sub>
5	Chausa	T <sub>5</sub>
6	Fazli	T <sub>6</sub>
7	Bombai	T <sub>7</sub>
8	Himsagar	T <sub>8</sub>
9	Sepia	T <sub>9</sub>
10	Alphonso	T <sub>10</sub>
11	Gulabkhas	T <sub>11</sub>

**2.2 Observations recorded**

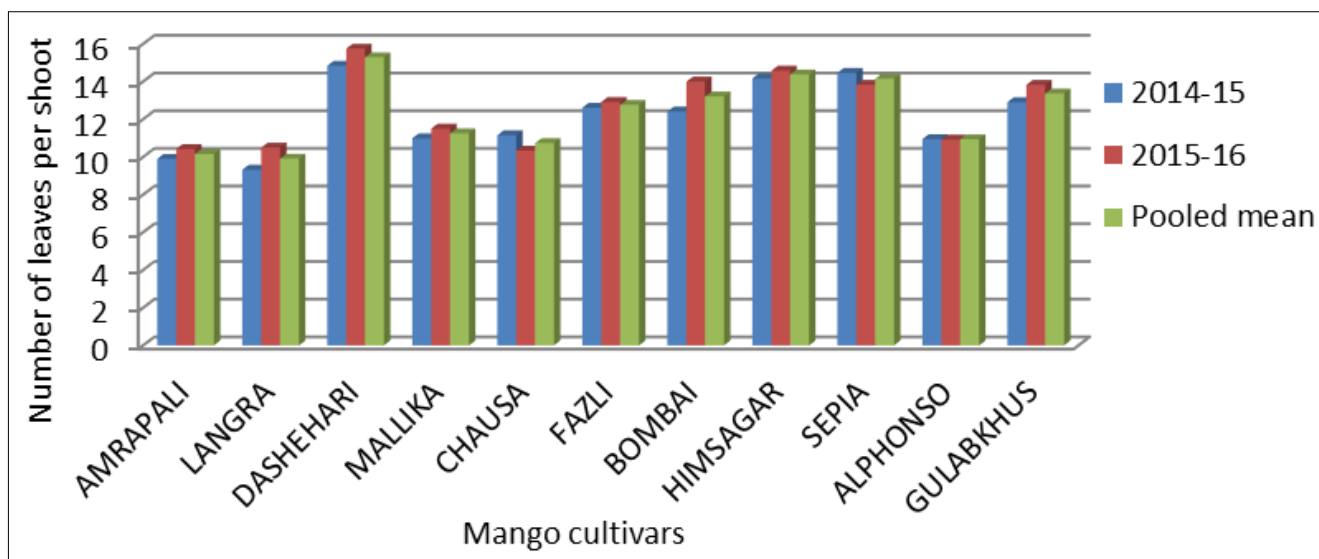
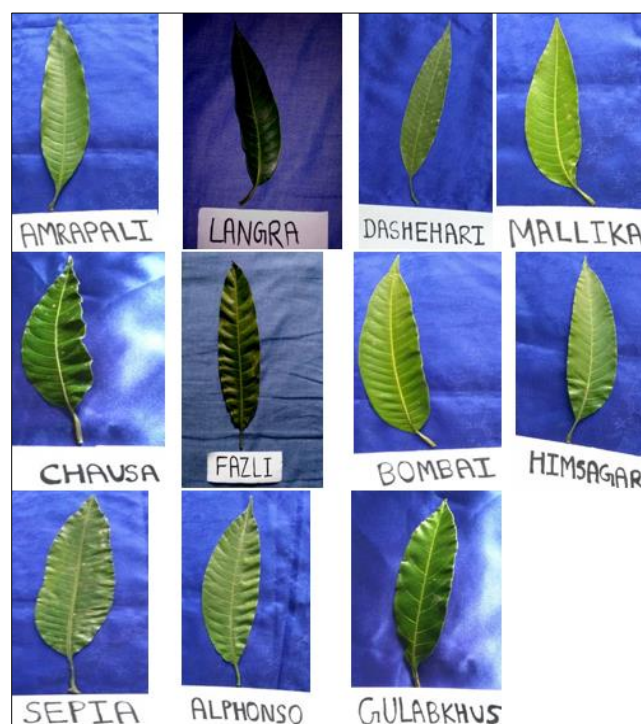
Observations on different characters under study were recorded for two years. Detailed procedures followed for recording different observations were as follows:

**3. Result and Discussion**

**3.1 Vegetative growth parameters**

The observations on number of leaves per shoot showed that maximum number of leaves were found in Dashehari (15.29) and minimum number of leaves were recorded in Langra (9.91). Maximum leaf area was observed in Chausa (96.96 cm<sup>2</sup>), whereas minimum value was recorded in Amrapali (58.43 cm<sup>2</sup>). Maximum leaf area per shoot was recorded in Sepia (1108.33 cm<sup>2</sup>). On the other hand, minimum value was noted in Amrapali (595.59 cm<sup>2</sup>). Majumder *et al.* (2011) [11] also observed significant variation in leaf characters of mango

genotypes. Leaf length, leaf width and petiole length varied from 113.16 to 35.82 cm, 3.59 to 9.76 cm and 2.53 to 5.33 cm, respectively. Leaf area varied significantly among the genotypes. The genotype MI24 had the highest leaf area (74.32 cm<sup>2</sup>) and the lowest leaf area was recorded in genotype MI98. Kundu *et al.* (2009) [10] reported that leaf length varied from 18.3 to 28.4 cm and leaf width ranged from 3.2 to 6.7 cm. Leaf size was larger in Ashu Guti (28.4 × 6.6 cm), Sinduria (26.6 × 6.3 cm) and Kuber Gaon Benka (23.7 × 6.5 cm). The results are in accordance with the findings of Ghavale *et al.* (2016). Leaves play an important role in the development of plants as well as its fruits. They act as site for manufacturing of food material from raw material drawn through the roots and the environment by the process of photosynthesis. The more leaf area per unit length of shoot resulted in more quantity of metabolites essential for fruit development and ultimately increased yield.



**Fig 1:** Number of leaves per shoot of different mango cultivars

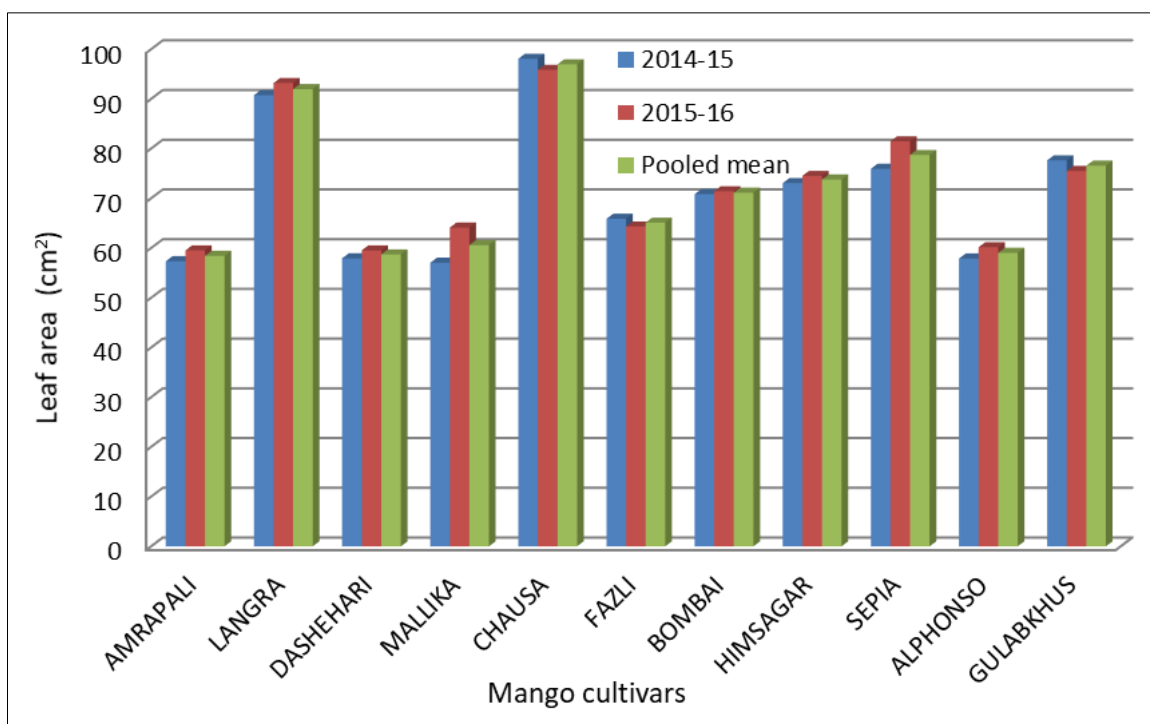


Fig 2: Leaf area (cm<sup>2</sup>) of different mango cultivars

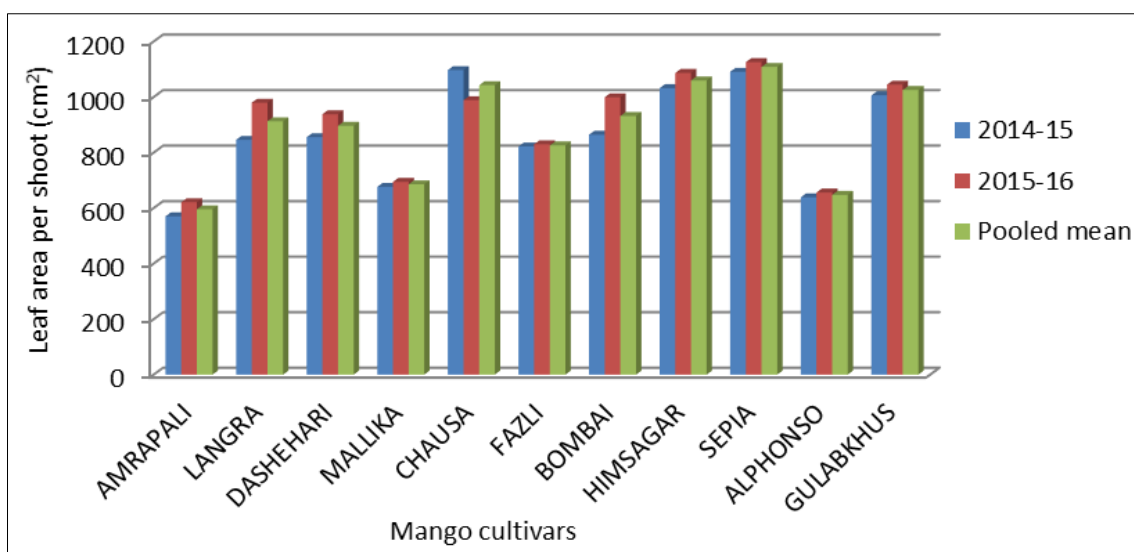
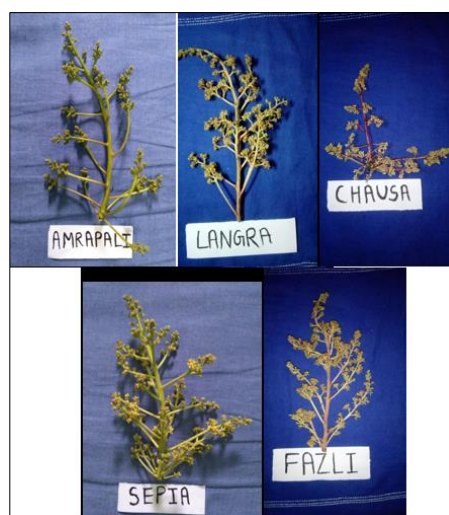


Fig 4: Leaf area per shoot (cm<sup>2</sup>) of different mango cultivars

### 3.2 Flowering characteristics

#### 3.2.1 Number of flowers per panicle

It was clearly observed that there was significant difference in number of flowers produced per panicle. Maximum number of flowers was observed in Langra (1839.13) while, minimum number of flowers recorded in Amrapali (954.75). The result obtained in the present study coincide with the results of Thimmappaiah and Suman (1987) [19] who observed that the number of flowers per panicle ranged from 302 – 994 in 13 different cultivars. Similar results were also reported by Kumar and Jaiswal (2004) [8] noted that number of flowers ranges from 718.75 to 1609. Whereas, Mukherjee (1953) [12] reported that depending on the variety the total number of flowers in a panicle might vary from 1000 to 6000. The results corroborate the findings of Asif *et al.* (2002) [4]. Variation in number of flowers per panicles attributed to inherent genetic differences of the mango cultivars.



### 3.2.2 Types of flowers and sex ratio

The maximum male flowers per panicle was recorded in Langra (1458.29) followed by Dashehari (1155.63) while, the minimum was recorded in Amrapali (797.58). The maximum number of hermaphrodite flowers per panicle was noted in Langra (456.00) whereas, the minimum number of hermaphrodite flowers per panicle obtained in Alphonso (98.75). Almost similar findings were also reported by Asif *et al.* (2002) [4]. The results obtained on number of male flowers in the present study were also in conformity with the observations made by Anila and Radha (2003) [1], who have reported that the number of male flowers ranged from 156 to 476. The results corroborate the findings of Asif *et al.* (2002) [4] and Majumder *et al.* (2011) [11]. Kumar *et al.* (2014) [7] reported that percentage of male flowers varied from 84.91 in Rumani to 53.10 in Kalepady. The percentage of hermaphrodite flowers ranged from 37.95 in Neelum and 16.12 in Swarnrekha. This might be due to environmental

fluctuations over the years and the locality. The significant difference between numbers of male and hermaphrodite flowers among the cultivars studied may be due to their genetic makeup, time of flowering, response to prevailing climatic conditions and endogenous growth hormones and their concentrations. Maximum sex ratio was calculated in Alphonso (9.00), while, the minimum sex ratio was observed in Langra (3.23). The differences among the various mango cv. were confirmed by the results of Sukhvibul *et al.* (2000) [17] and Sweidan *et al.* (2007) [18]. The variability in sex ratio of different cultivars seems to be governed by physiological and environmental conditions. Mukherjee (1997) [13] reported that the ratio of male flower to perfect flower was strongly influenced by environmental and management practices. The results were confirmed by the findings of Kumar *et al.* (2014) [7]. The variability in the flower sex ratio seems to be governed by a cultivar of physiological and environmental conditions (Asif *et al.*, 2002) [4].

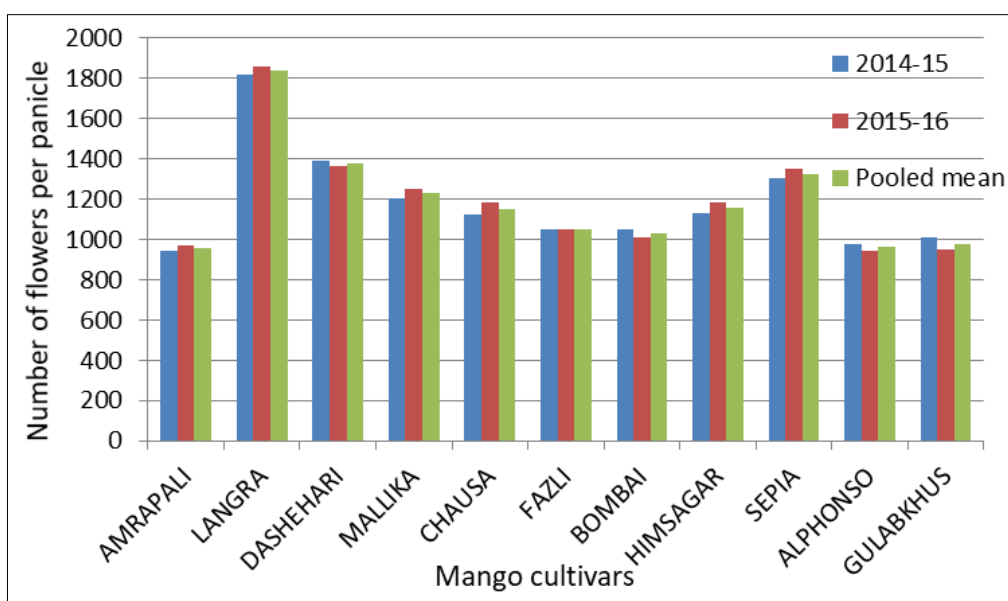


Fig 5: Number of flowers per panicle of different mango cultivars

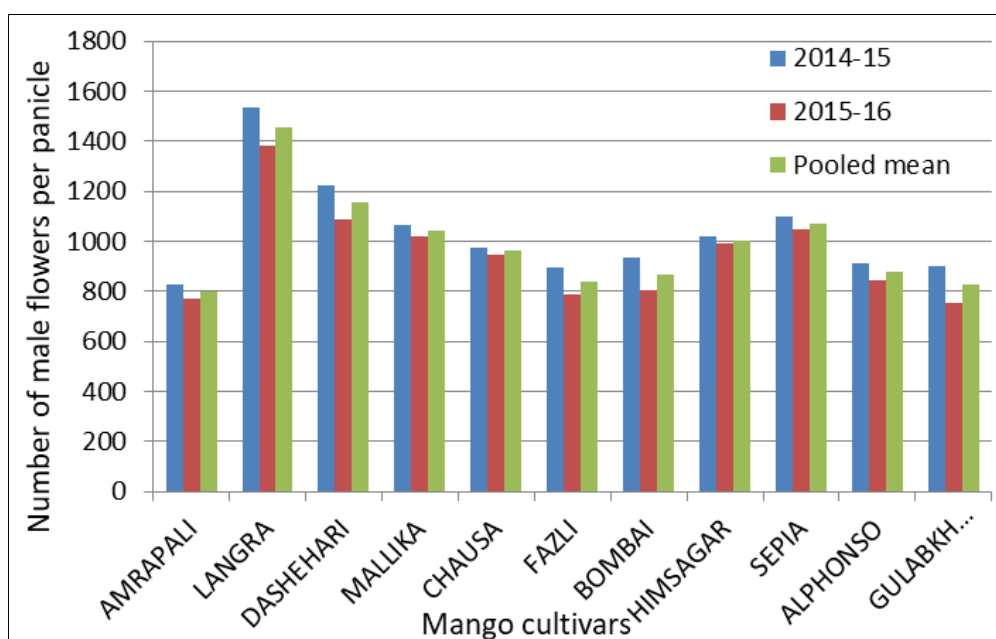


Fig 6: Number of male flowers per panicle of different mango cultivars

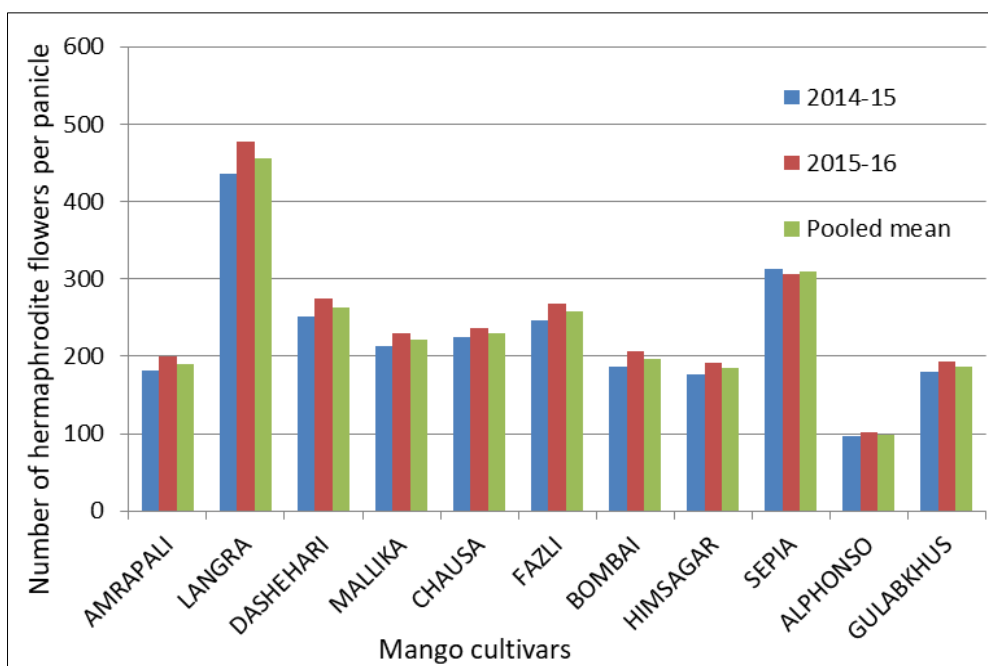


Fig 7: Number of hermaphrodite flowers per panicle of different mango cultivars

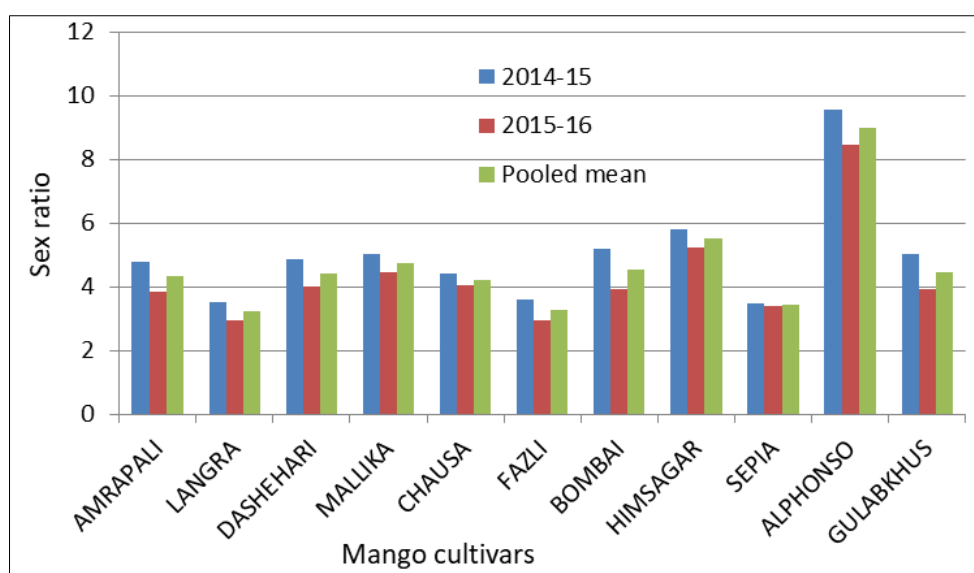


Fig 8: Sex ratio of different mango cultivars

#### 4. Yield (kg/tree)

There was significant difference obtained in yield in different cultivars. Maximum yield per tree was found in Langra (501.00 kg/tree) while, minimum yield per tree was observed in Gulabkhus (92.66 kg/tree). Similar results were obtained by Kumar and Singh (2005) [9] and Sinha *et al.* (2007) [16]. It might be due to varietal differences. The findings of this study are supported by the idea that yield is highly variable factor depending upon the cultivars and age of plants, climatic conditions, incidence of pests and diseases. Majority of the workers had the idea that yield potential was a varietal character.

Kundu *et al.* (2009) [10] found a wide variation in fruit yield (7.7-134.5 kg/tree). High yields were recorded in varieties Nababhog (134.59 kg/tree), Mithua (98.64 kg/tree) and Khota Lagga (95.95 kg/tree). The increase in yield in terms of weight might be either due to the large sized fruits or due to more number of fruits per plant.

#### 5. Organoleptic evaluation

##### 5.1 Fruit colour

The data regarding fruit colour was noted in all the varieties under study. Maximum fruit colour score (8.10) was noted in Langra and Gulabkhus and minimum (5.85) was recorded in Fazli, Himsagar and Sepia.

##### 5.2 Fruit texture

The evaluation of fruit texture of different varieties by panel of semi trained judges reflected that maximum fruit colour texture (8.10) was noted in Langra and Dashehari and minimum (5.40) was recorded in Fazli and Gulabkhus.

##### 5.3 Fruit taste

All the varieties under study were evaluated for fruit taste. Maximum score for fruit taste (8.55) was reported in Langra and minimum score (6.30) was noted in cultivars Fazli, Himsagar, Sepia and Alphonso.

#### 5.4 Fruit flavor

The data regarding fruit flavor was observed in all the varieties under study. Maximum fruit flavor (8.55) was reported in Langra and minimum (4.50) was recorded in Fazli.

#### 5.5 General appearance

All the cultivars were evaluated for general appearance of fruit. Maximum score (7.60) was given to cultivars Mallika and Langra and minimum score (4.95) was given to Himsagar.

Visual examination by the consumers is of significant importance parameter that determines the selection of any food for consumption. In mangoes, the fruit colour and the appearance are the important quality parameters those decide the consumer preference. Flavour is the sensory impression of a food or other substance and it is mainly determined by the chemical senses of taste and smell. The overall flavor impression is the result of the tastes perceived by the taste buds in the mouth and aromatic compounds detected by epithelium in the olfactory organ in the nose (Jeyavanan and Sivachandran, 2015).

#### 6. References

- Anila R, Radha T. Physico-chemical analysis of mango varieties under Kerala conditions. *J Trop. Agri.* 2003a;41(1/2):20-22.
- Anila R, Radha T. Studies on fruit drop in mango varieties. *J Trop. Agri.* 2003b;41(1/2):30-32.
- Anonymous. Indian Horticulture Database. National Horticulture Board, Gurgaon, Haryana. 2018.
- Asif M, Usman M, Jaskani MJ, Khan MM. Comparative study of flower, sex ratio in different cultivars of mango (*Mangifera indica* L.). *Intl. J Agri.Biol.* 2002, 4(2).
- Barui FK, Ghosh SN. Performance of different available mango cultivars for semi-arid region of west Bengal. *Env.& Ecology.* 2002;20(3):588-592.
- Jilani MS, Bibi F, Waseem K, Khan MA. Evaluation of physico-chemical characteristics of mango (*Mangifera indica* L.) cultivars. *J Agri. Res.* 2010;48(2):201-207.
- Kumar M, Ponnuswami V, Kumar PJ, Saraswathy S. Influence of season affecting flowering and physiological parameters in mango. *Scientific Research and Essays.* 2014;9(1):1-6.
- Kumar N, Jaiswal US. Bearing behaviour of some South and West India mangoes and its vegetative growth. *Haryana J Hort. Sci.* 2004;33(1/2):9-10.
- Kumar R, Singh S. Evaluation of mango genotypes for flowering, fruiting and fruit quality attributes. *Orissa J Hort.* 2005;33(1):77-79.
- Kundu S, Sanyal N, Datta P. Studies on potentiality of some mango varieties in West Bengal. *Journal of Crop and Weed.* 2009;5(2):68-71.
- Majumder DAN, Hassan L, Rahim MA, Kabir MA. Studies on physiomorphology, floral biology and fruit characteristics of mango, *J Bangladesh Agri. University.* 2011;9(2):187-199.
- Mukherjee SK. The Mango – its botany, Cultivation uses and future improvements. *Econ. Bot.* 1953;7:130-162.
- Mukherjee SK. Introduction: Botany and importance. In: *The mango Botany, Production and Uses* 1st edition (R. E. Litz Ed.), CAB International, Wallingford, UK. 1997, 1-19.
- Narvariya SS, Dharmi V, Singh CP, Kumar K. Efficacy of cultar on growth, flowering and yield behaviour of mango (*Mangifera indica* L.) cv. Dashehari. *Environment and ecology.* 2015;33(2A):827-831.
- Singh A, Singh CP, Singh AK. Flowering behaviour of mango genotypes under tarai conditions of Uttarakhand. *International Journal of Basic and Applied Agricultural Research.* 2015;13(3):400-406.
- Sinha B, Singh UK, Kumar N. Fruit quality of leading late varieties of mango. *The Orissa J Hort.* 2007;35(2):84-86.
- Sukhvilul N, Hetherington SE, Whiley AW, Smith MK, Vithanage V. Effect of temperature on pollen germination, pollen tube growth and seed development in mango. *Acta Hort.* 2000;509:609-616.
- Sweidan AM, Khattab MM, Haseeb GM, El Kheshin MA. Evaluation of some mango cultivars under desert conditions at Wadi El-Faregh region. *Egypt. J. Appl. Sci.* 2007;2(8A):149-160.
- Thimmappaiah, Suman CL. Sex in relation to fruit set and fruit yield in mango. *Punjab Hort. J.* 1987;27:8-11.
- Thulasiram R, Alagumani T, Duraisamy MR. Preferences of quality attributes for mango export: a conjoint analysis approach. *International Research Journal of Agricultural Economics and Statistics.* 2016;7(1):42-47.